Reports and Comments

Animal consciousness

This Report, commissioned by the European Food Safety Authority (EFSA), is an exhaustive survey of animal consciousness running to more than 160 pages and in excess of 700 citations. EFSA's intention for the Report was to answer four questions: What is the current knowledge on the different dimensions of consciousness and the scientific methods that can be used to determine whether an animal is conscious? Which types of consciousness, level and content, are present in vertebrate animals, specifically in livestock species, including farmed fish? What is the content of different livestock species' specific consciousness? What are the neuronal correlates of consciousness in different livestock species?

All of these questions clearly have important implications for EFSA in that they address the capacity of farmed livestock species (the welfare of which is the responsibility of EFSA) to have consciousness, and hence good or bad welfare. In fact, the questions all really relate to the classic question posed by Jeremy Bentham as "…can they suffer?" If animals are conscious and therefore sentient, they can have poor welfare and most people would therefore accept that they are deserving of moral concern. On the other hand, if some animals are not conscious it is reasonable to focus our concern elsewhere.

The Report takes a comprehensive approach, tackling first the historical, largely philosophical perspective ranging from Aristotle to modern day philosophical thought on consciousness. The Report then moves to consider the scientific evidence base for consciousness, beginning, unsurprisingly, with humans where more attention has been focused and where there is the benefit of language allowing humans to share their phenomenological experience of consciousness.

The third chapter discusses consciousness in animals, considering numerous phenomena which may be involved in animal consciousness (sensory perception and episodic memory, for instance), progressing to an examination of the evidence for neural correlates of consciousness (NCCs) in animals. This consideration of NCCs has important practical as well as theoretical relevance, for instance, in judging when consciousness is lost during stunning at the time of slaughter and thus identifying periods between loss of consciousness and death where the animal's welfare is of no further concern, so this summary is useful in highlighting how far neuroscience can help us detect and understand the various correlates of consciousness.

The final chapter considers some of the processes which might underlie conscious perception, with a particular emphasis on pain as a conscious emotion which likely underpins a great deal of animal suffering.

The conclusion of the Report begins in an unsurprisingly equivocal tone, the authors cannot answer the question whether animals have consciousness, and acknowledge that there are different types of consciousness and that there may also be degrees of consciousness. Even human consciousness can only be inferred in others and the absence of language in animals makes our ability to make inferences about their consciousness even more difficult. The more different an animal is from humans the more difficult it is for us to infer whether it has the capacity to be conscious, and the authors point out that the evidence for animal consciousness is concentrated amongst a very limited number of mammalian species commonly studied in the laboratory. Consciousness has been perhaps most studied in primates, but there have also been extensive studies of rodents. Surprisingly little is known about consciousness in livestock species, those animals which, arguably, we should be most interested in due to the vast number raised for food and whose welfare, assuming they are sentient, is therefore directly affected by humankind.

The authors arrive at a pragmatic conclusion given the paucity of evidence for or against consciousness in many species, that it cannot be ruled out even amongst taxa which differ fundamentally from humans, such as invertebrates, echoing a conclusion reached several years ago by a group of prominent neurobiologists (Low *et al* 2012) that consciousness was not likely to be solely the province of those species with the classical mammalian brain structure where higher functions are subserved by a neocortex. The final paragraph of the Report therefore reaches the inevitable conclusion that the precautionary principle should be applied, since there is, in the authors' opinions, "a wide range of animals which have a wide range of conscious abilities."

This Report takes an epic journey from the earliest thoughts of philosophers in antiquity through to the latest neurobiological and theoretical approaches to unravelling the mechanisms of consciousness, and for that it will prove useful to many who have a scientific interest in animal consciousness even if it still cannot answer Bentham's question with certainty. The Report also highlights how much more work is needed and, taking a utilitarian view of which Bentham would likely have approved, points to the need to focus effort where a better understanding of animal consciousness will inform us about, and in the future perhaps allow us to maximise the welfare of, the largest number of animals: those species which we farm or harvest for food.

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